



NOTE ON THE EPITROCHLEO-ANCONIUS OR ANCONIUS SEXTUS (GRUBER). By JOHN C. GALTON, M.A. (OXON.), F.L.S. (Pl. II.)

As the subject of the Epitrochleo-anconeus muscle has been well-nigh exhausted by Professor Wenzel Gruber, of St Petersburg, in an elaborate monograph<sup>1</sup>, and an appended supplement<sup>2</sup>, it is not my intention to do more than add a few figures of its occurrence in certain mammals whose myology in this respect is not represented in Prof. Gruber's plates, and to make a few general remarks upon the muscle in question; and I am the more encouraged to perform that which to some, nay even to myself, may seem a work of supererogation, by some recent expressions of Dr Burt Wilder, a well-known American anatomist, to the effect that "there is need of more accuracy in the dissection, delineation, and description of muscles, since at present there is great confusion respecting the nature of true muscular integers, and the basis of muscular homologies<sup>3</sup>."

Prof. Gruber, in the first of his monographs on the epitrochleo-anconeus, illustrates the subject by two lithographic plates, the first of which, in five figures, represents its occurrence in man, while in the second plate a comparative view is given of its presence in *Inuus nemestrinus*, *Cebus fatuellus*, *Galeopithecus volans*, *Myogale moschata*, *Ursus arctos*, *Felis leo*, *Felis domestica*<sup>4</sup>, *Dasyurus viverrinus*, *Lepus timidus*, *Dasyppus tricinctus*, and *Phoca vitulina*. This anatomist, though he figures its occurrence in only eleven genera of mammals, exclusive of man, has, nevertheless, found this muscle in no fewer than forty-seven

<sup>1</sup> Ueber den Musculus epitrochleo-anconeus des Menschen und der Säugethiere (mit 3 Tafeln). *Mém. de l'Acad. Imp. des Sciences de St. Pétersbourg*, 7th ser. Tom. x. No. 5.

<sup>2</sup> Nachtrag zur Kenntniss des Musculus epitrochleo-anconeus der Säugethiere. *Bulletins de l'Acad. Imp. des Sciences de St. Pétersb.* Tom. xii. p. 329. No figures accompany this paper. A few supplementary remarks upon this muscle are further made in the course of a paper entitled Ueber den Musculus Anconeus v. des Menschen. *Mémoires.* Tom. xvi. No. 1. 1871.

<sup>3</sup> The Pectoral Muscles of Mammalia. *Proc. Americ. Assoc. for Advancement of Science*, Aug. 1873, p. 307. Published 1874. Ithaca, N. Y.

<sup>4</sup> Possibly the *anconeus internus* of Strauss-Durekheim. *Anatomie Descriptive et Comparative du Chat*, Tom. ii. p. 351, and Atlas, Plate ix. Fig. 3, 17. Paris, 1845.

genera, a list of which is given at the end of his supplementary paper<sup>5</sup>. I am able to add to this list and give figures of three new genera, viz. *Phascolomys* (*wombata*), *Echidna* (*setosa*), and *Cholopus* (*didactylus*), and to give in addition a figure of the muscle in *Myrmecophaga tamandua*, in which animal it has been already described, but not figured, by Rapp in his well-known monograph<sup>6</sup>, under the name of "anconeus parvus."

Georges Cuvier, it is true, has in his magnificent atlas figured this muscle in no less than sixteen genera of mammals<sup>7</sup>, but, not only entirely omitting to delineate it, as Prof. Gruber feelingly remarks, in genera where it is undoubtedly present<sup>8</sup>, he, when he does represent it, masks it under a crowd of *aliases*, and at times so misrepresents it that we need scarcely wonder at the utterance of one of his own countrymen: "Mais les desseins qu'il en donne sont assez imparfaits, et n'ont pu nous être que d'un faible secours<sup>9</sup>."

The specimens from which my dissections were made were kindly placed at my disposal a few years ago by Professor Rolleston, of Oxford, in order that I might verify certain points in complete dissections which I was making of two members of the Edentata. Unfortunately I have no very full and precise notes of these supplementary dissections, but it will be, I think, practically enough to state that in every instance the epitrochleo-anconeus arched over the ulnar nerve, and that all the drawings are taken from the inner aspect of the right cubital region. I have also in my possession a drawing of the cubital region of the opposite side in a seal (*Phoca vitulina*) which well shews the branchlet given off from the ulnar nerve to the epitrochleo-anconeus, but as Prof. Gruber has figured the self-same region in the same animal in his monograph, I do not consider it worth while to reproduce it here.

The muscle in question seems to be more constant in the Edentata—a group to which, through circumstances, I have

<sup>5</sup> *Nachtrag*, &c. s. 334.

<sup>6</sup> *Anatomische Untersuchungen über die Edentaten*. 2te Auf. s. 48. Tübingen, 1852.

<sup>7</sup> *Anatomie Comparée, recueil des planches de Myologie dessinées par Georges Cuvier, ou exécutées sous ses yeux par M. Laurillard*. Fol. Paris, 1855.

<sup>8</sup> *Nachtrag*. s. 330.

<sup>9</sup> M. Georges Pouchet, *Mémoires sur le Grand Fourmilier*. liere Livraison. Paris, 1867.

paid particular attention—than in any other mammalian order, though this may, of course, be due to the fact, that its several members are much fewer in number than those of a larger group, *e.g.* the Carnivora. It has been previously figured and described by Gruber and Murie<sup>10</sup> in *Dasypus (Tolypeutes) trincinctus*, described and figured by myself<sup>11</sup>, and figured only by Cuvier in *Dasypus sexcinctus*, described and figured by Pouchet in the Great Anteater<sup>12</sup>, under the name of *vaste interne*: described and figured by myself<sup>13</sup> and described only by Prof. Humphry<sup>14</sup> in *Orycteropus*, and described only by Gruber<sup>15</sup> and Prof. Humphry<sup>16</sup>, in *Manis*: by myself as occurring in a very young specimen of *Tatusia novem cinctus* (*D. Peba*), having the umbilical cord still adherent; by Prof. Humphry<sup>17</sup>, Gruber, and myself<sup>13</sup> in *Cyclothurus*; by Prof. Humphry and Prof. Macalister<sup>19</sup> in the *Aï*, and by Rapp<sup>20</sup> and Gruber in the *Tumandua*; and, though it is neither figured nor categorically mentioned by Prof. Hyrtl in his truly classical monograph on *Chlamydophorus truncatus*, its presence seems to be hinted at in the following sentence: “Ceterum triceps non omnis metam suam in olecrano attingit, sed crasso lacerto, ultra cubitum producto, internam antebrachii regionem visitat, ubi *Tensoris fasciæ antebrachii* munere fungitur<sup>21</sup>.”

From the foregoing then it may be stated that the epitrochleo-anconeus is, almost without exception, present, and well developed, moreover, throughout the whole group of Edentata; but this, of course, may be owing to the fact that from the limited number of the members of this group, the

<sup>10</sup> On the Habits, Structure, and Relations of the Three-banded Armadillo (*Tolypeutes Coumrus*). *Trans. Linn. Soc.* Vol. xxx. Tab. 25, Fig. 32.

<sup>11</sup> *Ibid.* Vol. xxvi. p. 539, and Tab. 44, Fig. 2.

<sup>12</sup> *Loc. cit.* p. 11, and Pl. III. h'.

<sup>13</sup> *Trans. Linn. Soc.* Vol. xxvi. p. 579, and Tab. 45, Fig. 1.

<sup>14</sup> Under the name of *anconeus internus*. *Journ. of Anat. and Phys.* 2nd Series, Vol. i. p. 301.

<sup>15</sup> In a very young specimen, only 9½ in. long including tail. First Memoir, p. 22.

<sup>16</sup> *Journ. of Anat. and Phys.* Vol. iv. p. 39.

<sup>17</sup> *Ibid.* Meekel makes no mention of the musele in his description of the anatomy of the Two-toed Anteater. *Meekel's Archiv.* Ver. Bd. 1819.

<sup>18</sup> *Ann. and Mag. Nat. Hist.* 4th Series, Vol. iv. p. 251.

<sup>19</sup> On the Myology of *Bradypus tridactylus*, with remarks on the general anatomy of the Edentata. *Ann. and Mag. Nat. Hist.* 4th Series, Vol. iv. p. 59. 1869.

<sup>20</sup> *Op. cit.* s. 48.

<sup>21</sup> *Denkschrift. der k. Akad. der Wissen. in Wien*, p. 37. ix. Bd. 1855.



means of coming to a correct conclusion have been easier arrived at than had more items been included in the sum total.

Now in the Cheiroptera, on the other hand, to judge from the little which has been contributed to the myology of this order, this muscle is entirely absent, for neither does Prof. Humphry mention its presence in *Pteropus*<sup>22</sup>, nor does Prof. Macalister indicate either by figure or description its occurrence in those members of the Cheiroptera, upon the dissection of which his valuable monograph is based<sup>23</sup>. Prof. Gruber, it is true, describes it as present in one of the Cheiroptera, but this is no real exception, as the animal in question, being a *Galeopithecus*, must, in accordance with the most recent system of classification, be placed amongst the Insectivora.

In that smallest of all the mammalian orders, the Monotremata, the epitrochleo-anconeus has been found by Prof. Wood in the *Ornithorhynchus*<sup>24</sup>, and by Mr Mivart<sup>25</sup> and myself in two separate species (or varieties?) of *Echidna*, so that we may almost safely assume that this muscle is always present in this order.

In the Ungulata this muscle seems to occur but rarely, or, what is more likely, has not as yet been carefully looked for. The late Prof. Gratiolet, though he does not figure it, seems to have recognised it as a factor of the triceps, for when writing of this muscle in his posthumous work on the Hippopotamus, he says: "Le vaste interne s'attache d'une part à l'une des faces latérales de l'olecrâne et d'autre part à l'humérus. Ses relations avec ce dernier os sont toutes particulières. Il ne s'attache point à sa face postérieure, mais s'enroule sur sa face interne, pour se terminer sur sa face antérieure, jusqu'à la crête qui sépare cette face de la face externe. Cette disposition à l'enroulement

<sup>22</sup> *Journ. of Anat. and Phys.* Vol. III.

<sup>23</sup> *Phil. Trans.* 1872.

<sup>24</sup> *Proc. Roy. Soc.* June 18, 1868, p. 497. In Meckel's description of the muscles of this animal—which is, however, very short—in his well-known monograph there is no mention made of the epitrochleo-anconeus, nor is it figured in any of the plates.

<sup>25</sup> On the Anatomy of *Echidna Hystrix*. *Trans. Linn. Soc.* Vol. xxv. This anatomist, though he does not specifically mention or figure this muscle, describes, nevertheless, a "distinct slip" of the triceps which "forms an arch (extending from the inner condyle to the olecranon) beneath which pass the inferior profunda artery and the ulnar and median nerve."

est fort analogue à celle que présente le muscle supinateur, et il résulte des conséquences pareilles. En effet, en rapprochant fortement l'olecrâne de l'épitrochlée, le vaste interne est lui-même supinateur à un degré très-prononcé. Rien n'est certainement plus curieuse et plus digne de l'attention du naturaliste philosophe<sup>26</sup>."

With regard to the Carnivora, Rodentia, and Insectivora, the members of these three orders are so numerous that as yet we have not been able to arrive at any generalization as to the occurrence of the epitrochleo-anconeus in them; though there seems to be warrant for the statement that this muscle is fairly frequent in all the three groups.

When we arrive at the Primates we find an evident falling off in the frequency of occurrence of the muscle; for though it is sparingly—certainly not universally<sup>27</sup>—present among the Lemurs and lower monkeys, it seems to become lost among the anthropoid apes<sup>28</sup>, and occurs finally in man, though comparatively frequently as a muscular anomaly, still only as an anomaly.

Prof. Gruber, in the first of his two papers (s. 24), rightly concludes that the muscle in question is homologous in man and the other mammals, this conclusion being supported by its nervous supply. In man, however, it is sometimes an independent muscle, sometimes a factor of the triceps brachii, while in the rest of the mammalia it is always an independent structure. It is further stated that its *function* in man is to guard the ulnar nerve and the vessels which accompany it from pressure, and to act as adjutant to the triceps brachii, and to the *ligamentum cubiti mediale* in the way of support of the elbow-joint on its median aspect. In other mammals it acts as an adductor of the olecranon and a supinator of the forearm, being adjutant to the extensor or extensors of the forearm, and serv-

<sup>26</sup> *Recherches sur l'Anatomie de l'Hippopotame, publiées par les soins du Dr. E. Alix*, p. 266, footnote. Paris, 1867.

<sup>27</sup> It is neither mentioned nor figured in Mivart and Murie's most elaborate paper, On the Anatomy of the Lemuroidea. *Trans. Zool. Soc.* Vol. VII. Nor in Burmeister's *Beiträge zur näheren Kenntniss der Gattung Tarsius*. Berlin, 1846.

<sup>28</sup> No mention is made of its presence by Vrolik, Church, or Champneys in their writings on the anatomy of the Chimpanzee, Orang-utan, and *Cynocephalus Anubis*, and Prof. Macalister expressly states, in his paper On the Muscular Anatomy of the Gorilla (*Proc. Roy. Irish Acad.* Vol. I. Ser. II. Science, p. 502) "There is no anconeus internus."

ing to protect from pressure either the ulnar nerve and its accompanying vasa alone, or the median nerve and brachial vessels in addition to these.

In man it has the character of a structure retained from an earlier and lower condition of existence, being, in other words, a "Thierbildung," while in other mammals it is a necessary and functional mechanical appendage of the elbow-joint.


In order to find out the frequency of the occurrence of this muscle in man, Prof. Gruber in the space of less than a month examined one hundred bodies, that is, two hundred elbow-regions, and found its frequency thus distributed:—It was met with in 26 males and 8 females, and occurred on both sides in 15 male and 4 female subjects. It was found on one side only in 11 males and 4 females, being on the right side only in 9 males and 3 females, and on the left side alone in 2 males and 1 female. Without reckoning difference of sex it was present in every three subjects and in every four extremities.

This muscle, when present, is generally well developed, rather than weak, in man, and is usually stronger in males, and on the right side, than in females, and on the left side<sup>29</sup>.

Up to this time Prof. Gruber had thought that the presence of a third head to the biceps brachialis was the most frequent anomaly in the upper extremity, but he now came to the conclusion that it was exceeded in frequency by the epitrochleo-anconeus.

Though I will readily concede that the epitrochleo-anconeus may in man be occasionally adjutant to the triceps, it seems to be rather a straining after a τέλος to assume that any function other than an active one should be accredited to a muscle rather than it should be simply deemed rudimentary. For I cannot help regarding the function of an organ but as dependent upon its physical capacity, and could as soon conceive of a ligament taking upon itself the active duties of a muscle, as of the latter

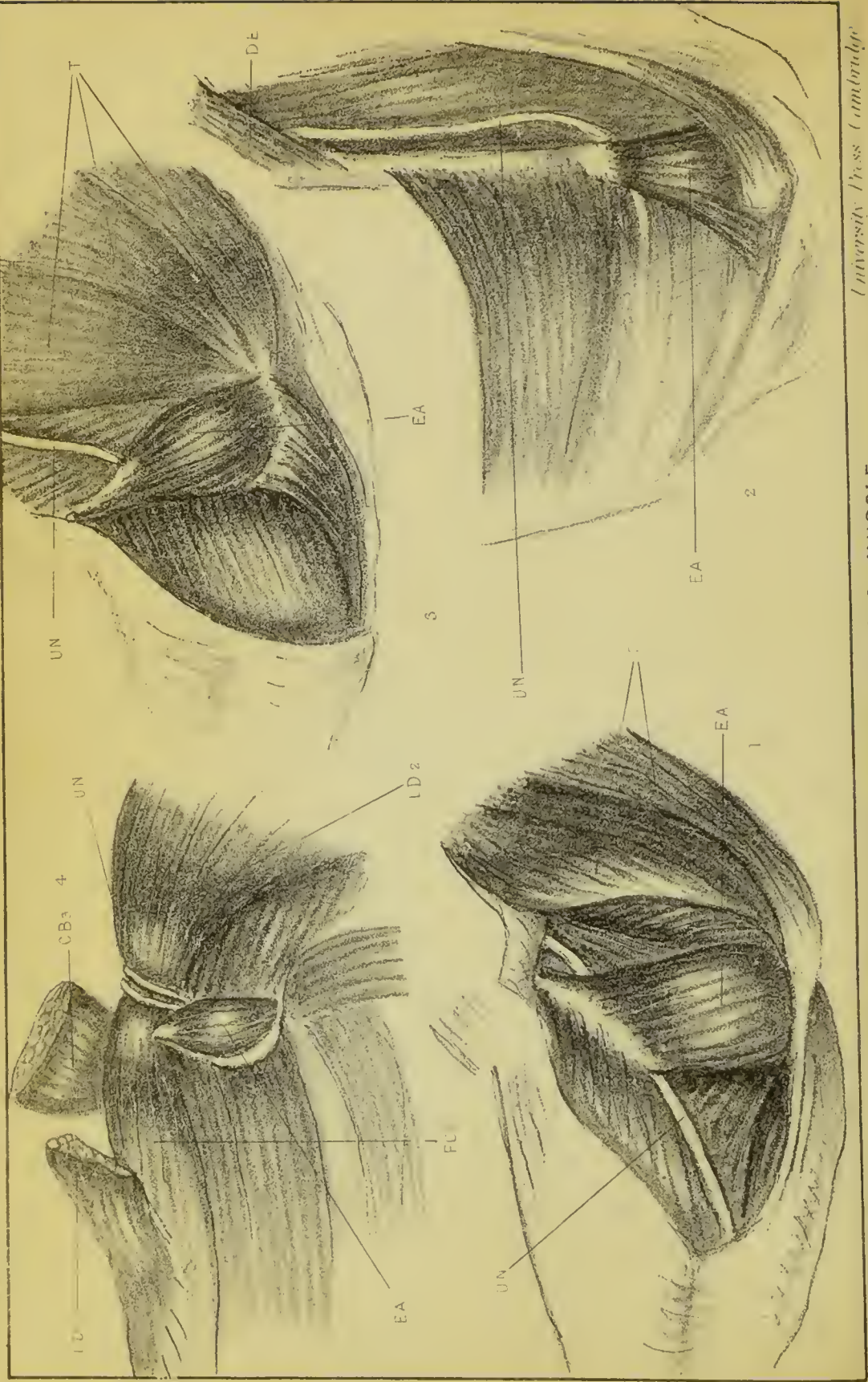
<sup>29</sup> Prof. J. Wood found this muscle (see *Proc. Roy. Soc.* June 18, 1858, p. 497) in four male subjects out of 36, in three instances in both arms, and in one on the left side only. A percentage of occurrences of this muscle founded upon Prof. Wood's more limited—thanks to the encouragement to the study of anatomy afforded by the legislature in this country—series of observations is, it will be readily seen, much smaller than one grounded upon the records of the Russian anatomist. This seeming fallacy can, it may possibly be objected, be due not to arithmetical considerations but to real differences of race.



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enacting the passive rôle of its far less highly organized coadjutor. Better declare at once that a purely muscular slip is functionless, than assume that it exercises the office of protecting a nerve from external injury.

Seeing then that this muscle has been found so frequently in all the lower mammals, and that it is so invariably present in an order—and that, too, one of the lowest—the myology of which, at any rate, has been most carefully studied, while it becomes less frequent among the lower Primates, to finally disappear among the anthropoid apes, and only to emerge again occasionally in man as an “anomaly,” we have reason for regarding it, as we do such a structure as the supracondyloid process, as a now almost functionally useless heirloom, which has descended to us from very remote ancestors<sup>30</sup>.

<sup>30</sup> One source of difficulty and of probable fallacy must have occurred to every one, though no allusion is made to it in anatomical writings—in the fact that while perhaps only one member of a species among the lower mammals has been once dissected, hundreds of human subjects—in spite of the indifference manifested in the majority of London dissecting rooms—have been under careful investigation, so that it is possible that in the case of the former, instead of that which is normal presenting itself, an anomaly has been stumbled upon, which has forthwith been registered as normal.

### EXPLANATION OF PLATE.

Inner aspect of the right elbow-regions in

Fig. 1. *Myrmecophaga Tamandua*.

Fig. 2. *Choloerus Didactylus*.

Fig. 3. *Phascalomys wombata*.

Fig. 4. *Echidna Setosa*.

T. Triceps.

E. A. Epitrochleo anconeus.

U. N. Ulnar nerve.

CB<sub>3</sub>. Coracobrachialis tertius.

LD<sub>1</sub>. } Latissimus Dorsi, primus et secundus.  
LD<sub>2</sub>. }

F. C. U. Flexor Carpi Ulnaris.

D. E. Dorso-epitrochlien.

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